

Appendix B: Control of Non-Native Invasive Plant Species Guide

Framework of Best Management Practice

According to a survey conducted by the U.S. Department of Agriculture on the rangelands in the west, western wild lands are being lost at an alarming rate of 4,600 acres per day to non-native invasive plant species (U.S. Department of the Interior 1977). This estimate should be considered conservative due to the lack of careful inventories in many regions, and translates to a 14% annual increase in the number of acres infested. If the infestation continues at this rate it is predicted that as many as 38 million acres of western wild lands alone will be taken over by non-native invasive species by the year 2005. Due to globalization of trade, increased speed of travel cargo shipments, and mankind's ever-increasing mobility, non-native plant species have been extensively introduced to new locations around the world. Often these new species spread rapidly because they have no effective natural enemies in their new locations. In the United States, it is estimated that 50% to 75% of problem weeds were either accidental or intentional human introductions from other areas (Wheeden 1999). It has been estimated that NNIPS cost the United States approximately \$27 million annually for herbicide alone (Pimentel 1999). Traditional methods of weed control, such as mechanical methods and use of herbicides, are neither practical nor desirable for such wide-ranging stands of non-native invasive plant species; biological control has become a viable strategy for their control.

Management of invasive species problems is usually the responsibility of government agencies, which must select targets for management and develop management strategies. With a growing number of invasive species problems due to increased mobility between military installations and recognition of the severity of the threat to conservation, managers of military lands are confronted with more potential targets than their resources can address. Therefore, these managers need an understanding of the natural history of an invasive species, its status in the country, and its specific impact in ecological and economic terms. There is a general lack of scientific methodology for evaluating the risk posed by invasives to biodiversity, and for understanding the complex relations of non-native invasive species within plant communities and the environment. These invasive species may be symptoms of other ecological problems (e.g., overgrazing of grasslands, eutrophication of waterways due to erosion, etc.), such that management of particular invasives may not provide a lasting solution, and/or may lead to their replacement by other invasive species.

There are three principle approaches to control NNIPS: (1) physical/mechanical (2) chemical, and (3) biological. Treatments that suppress or retard the growth of NNIPS, while presenting the least risk to applicators, site users, and environment, are preferable to those that have more toxic or broad-spectrum effects. Physical (mechanical) and biological control agents usually fit this description, as do some careful applications of herbicides. Each has been successful in specific instances and there is considerable potential for integration of the approaches. New technologies, particularly those involving genetic manipulation are in development against a range of target invasives. In addition, the risks and environmental impact of selected control measures must be weighed against the benefits achieved to ensure best management practices.

Physical/Mechanical Controls

Heat Treatment

Various systems have been invented to deliver high temperatures to kill foliage of plants. These include flamers, hot water or steam applicators, and infrared radiation applicators, which destroy plant cellular function. It is only necessary to heat the leaf long enough to destroy the waxy cuticle of the leaf and disrupt the cells. Torching or boiling the plants until damage can be seen immediately is unnecessary and may stimulate regrowth of some established perennials such as morning glory (*Ipomoea sp.*). Effects of heating may be visible in as little as an hour or may take up to several days to appear. Seedlings, annuals, young perennials, and germinating seeds are most susceptible to heat damage. They are usually killed by a single treatment. None of the treatments penetrates into the soil or below a layer of gravel; therefore, they do not kill the roots of established perennials. Perennial species may require three or more treatments in a season to deplete the roots and kill the plant. Broadleaf invasives are more easily damaged by heat than grasses. The growing tips of grasses are encased in a heat resistant sheath, which makes it possible to selectively control weeds in turf using heat. Some other plants are quite susceptible to heat. Using heat to control non-native invasive species is ideal where selective control is required.

Flamers have been in use for more than 50 years to destroy vegetation. They produce temperatures of approximately 900 °C. Several sizes are available from hand-held models to large tractor- or truck-mounted models.

Hot water or steam applicators have become widely used in the past 10 years due to their higher safety ratings. Temperatures reach 100-200 °C. While these are currently very large truck/tractor-mounted applicators, smaller hand-held models are being developed.

Infrared radiation applicators burn propane fuel to produce a radiant heat source. Equipment now available includes a wide range of hand-held applicators for spot treatments and include hand-propelled or tractor-mounted units for broader treatments.

Mulches for Weed Control

Mulches are soil coverings of organic materials (e.g., compost, straw, shredded bark, pine needles, wood chips, saw dust) or various synthetic materials such as plastic sheeting or landscape fabrics (geotextiles). A common combination is a geotextile weed mat covered with a layer of bark or gravel. Mulches suppress weeds by blocking the light they need to grow. As soon as the seeds germinate, they require light for continued growth. Some seeds will not even germinate unless they are exposed to bright light. To be effective at suppressing weeds, organic mulches should be at least 10 centimeters thick for heavy, dense materials (compost) and at least 16 centimeters thick for lighter materials (pine needles). Mulches should be applied as soon as the soil is cultivated or disturbed because weed seeds brought to the surface start to germinate immediately. **Note:** Using fresh saw dust, wood chips, or straw as mulch can temporarily rob the soil of nitrogen as the materials decompose.

Hand Pulling (“manual control”)

Hand and mechanical pulling has been around since the dawn of agriculture. It is by far the least invasive method of control for weeds. Studies done by The Nature Conservancy (TNC) have shown that “weeding,” while labor intensive and expensive, can effectively reduce small patches of NNIPS. When used in combination with other control techniques, control can reach up to 100%. At the University of Colorado, Professor Tim Seastedt has started a new program studying the use and effectiveness of hand pulling to control NNIPS. While hand pulling of weeds may in fact be the oldest method of control, it has

been recently enhanced. Today, many specific tools exist to reduce the number of man-hours and increase the effectiveness of the laborer. An example of such a tool is the “Weed Wrench” that allows the individual to extract woody plants having an extensive root system which would prevent hand pulling.

Mowing

Mowing diffuse knapweed (*Centurea diffusa*) reduces seed production up to 85% during critical stages compared to unmowed areas (Roche and Roche 1993). For certain thistles and grasses, it has been shown that mowing at seed onset reduces the spread, thereby maintaining the current NNIPS population. Although mowing can be an effective mechanism for NNIPS control, it is vital that mowing take place during the optimum life stage of the NNIPS, thereby avoiding the risk of increasing NNIPS populations.

Chemical Controls

Herbicides

Herbicides work through several modes of action, including the inhibition of electron transport, growth regulation through auxin/cytokinin mimicry, amino acid synthesis inhibition, seedling growth inhibition, photosynthesis inhibition, lipid synthesis inhibition, cell membrane disruption, and pigment inhibition. Herbicides can be divided into two categories: selective and non-selective. Selective herbicides affect some types of plants, but not others. For example, several herbicides kill broadleaf weeds, but do not affect grasses. Non-selective herbicides can kill any type of plant. They are used to control all vegetation in an area or as spot treatments on deep-rooted plants and those that spread by rhizomes. Herbicides remain general in their specificity, with a host of side effects and application problems. Claims of herbicide efficacy using extremely small amounts are usually based on mixtures that are more concentrated and therefore more hazardous. If chemical controls are necessary, the least toxic, effective herbicide should be used.

The following criteria for product selection should be used:

- It must be effective and registered for the specific weed type,
- It must be applied as a spot treatment instead of broadcast application where possible,
- It should be applied at the optimum time of day and/or year to have greatest impact on target species, and
- It does not have long-term residual effects.

Fatty Acids

Naturally occurring fatty acid compounds are used in production of soaps. In the right concentration, they will kill plant foliage. They act quickly, with results sometimes evident within two hours. They do not kill the roots of established plants. There is no herbicidal activity in the soil and no residual effect. Fatty acids are most effective on seedlings and annual plants. They also suppress or top-kill some perennials. FAS should be applied in spring or summer to actively growing plants, less than 13 cm tall. Repeat applications are required to kill established plants and perennials.

Corn Gluten Meal

A new, non-toxic herbicide made from extracts of food-grade corn gluten meal has been registered in the United States. It works by suppressing the germination of seeds. Regular use on turf grass has shown a 50-60% drop in weed infestation within the first year, and higher levels of control in later years (Bingaman, McDade, and Christians 1995; see <http://www.hort.iastate.edu/gluten/>).

Dandelion Mycoherbicide

Researchers at McGill University in Montreal (U.S. Patent #5,994,267, “*Sclerotinia minor* for broad spectrum broadleaf weed control”) have discovered a strain of fungus (*Sclerotinia minor*) that kills dandelions and other broadleaf weeds without harming surrounding grasses. In suitable conditions, control has been shown to be more effective and twice as fast as herbicides containing 2,4-D, mecoprop and dicamba.

Biological Control

Using biological agents for weed control is the most beneficial of all methods for reducing the spread of NNIPS while reducing cost and dangerous herbicide use. Once a population of biocontrol agents is established, minimal effects are required to maintain it. In addition, the use of natural enemies does not require a high level of economic or technologic input. Another benefit is that natural enemies are less ecologically disruptive, thereby maintaining natural biodiversity. Many insect and microbial controls are currently being developed by the USDA and universities (e.g., Agricultural Research Service, University of Illinois, University of Hawaii).

Leafy spurge and knapweed are at the forefront of targeted species. A concerted USDA effort to bring them under control using several dozen insect and microbial agents is proving to be very successful (<http://www.nps.ars.usda.gov/programs/usmap.htm?stateabbr=mt&npnumber=304>). Such intensive programs will potentially succeed, resulting in a decrease of NNIPS. The research and subsequent release of agents carries with it the risk that unintended hosts could be attacked and decimated; there are examples showing this has occurred (Bess and Haramoto 1972, Duan and Messing 1998, Follett and Duan 2000, and Howarth 1991). Research requires time and quarantine before release. Although safeguards are thorough, not every native plant and growing environment can be tested. Some desirable characteristics of biological control agents would include:

- They are generally specific to one plant species,
- They have a marked negative impact on plant individuals and the population dynamics of the target species,
- They are prolific,
- They thrive and become widespread in all habitats and climates in which the target species occurs, and
- They are good colonizers.

Re-cap

Physical/mechanical, chemical, and biological Best Management Practices (Table B1) are generally most effective when used in combination with one another. Not all BMPs are appropriate for each species. Many species will react positively to certain controls, resulting in an increase in population size. Therefore, it is vital to know the target NNIPS ecology, pathology, systemics, etc. That knowledge will allow the land manager to choose appropriate BMPs having the greatest chance for success, resulting in a savings on time, dollars, and NNIPS spread.

Table B1. Chemical, physical/mechanical, and biological BMPs.

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Acaena novae-zelandica</i>	biddy biddy	None	Pull, bag & burn	<i>Ucona acaenae</i>
<i>Acer ginnala</i>	Amur maple	Glyphosate	Repeated cutting	None
<i>Acer platanoides</i>	Norway maple	Glyphosate	Repeated cutting	None
<i>Achnatherum brachychaetum</i>	punagrass	Sethoxydim; Clethodim	Frequent mowing	None
<i>Acroptilon repens</i>	Russian knapweed	Chlorsulfuron; 2, 4-D	Repeated mowing	<i>Aphthona</i> sp. <i>Subanguina picridis</i>
<i>Aegilops cylindrica</i>	jointed goatgrass	Glyphosate + 2, 4-D	Burning, tillage	None
<i>Aegilops geniculata</i>	ovate goatgrass	Glyphosate + 2, 4-D	Burning, tillage	None
<i>Aegilops triuncialis</i>	barbed goatgrass	Glyphosate + 2, 4-D	Burning, tillage	None
<i>Ageratina adenophora</i>	glad bearing thoroughwort	Glyphosate	Pull, dig	None
<i>Agropyron desertorum</i>	crested wheatgrass	Glyphosate	Pull, dig	None
<i>Agrostis gigantea</i>	redtop	Glyphosate	Pull, dig	None
<i>Albizia julibrissin</i>	silk tree, mimosa	Accord; Roundup; Garlon	Repeated mowing	None
<i>Albizia lebeck</i>	woman's tongue tree	Accord; Roundup; Garlon	Repeated mowing	None
<i>Alhagi maurorum</i>	camelthorn	Tordon 22K; 2, 4-D	None	None
<i>Alliaria petiolata</i>	garlic mustard	Roundup	Pull, bag & burn	None
<i>Ammophila arenaria</i>	European beachgrass	Roundup; salt	Dig	None
<i>Ampelopsis brevipedunculata</i>	peppervine	Triclopyr; Glyphosate	Pull, bag & burn	None
<i>Anagallis arvensis</i>	scarlet pimpernel	Glyphosate	Repeated cutting	None
<i>Anchusa arvensis</i>	annual bugloss	Phenoxy	None	None

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Anchusa officinalis</i>	common bugloss	Phenoxy	None	None
<i>Anthemis arvensis</i>	scentless chamomile	Glyphosate	Pull or dig	None
<i>Anthemis cotula</i>	mayweed chamomile	Glyphosate	Pull or dig	None
<i>Anthoxanthum odoratum</i>	sweet vernalgrass	Dalapon	Pull, till, or repeated mowing	None
<i>Anthriscus sylvestris</i>	cow parsley	Mecoprop; Dicamba; Dichlorprop	Pull, till, or repeated mowing	None
<i>Antigonon leptopus</i>	coral vine	Glyphosate	Pull or dig	None
<i>Aralia chinensis</i>	Chinese angelica tree	Glyphosate or Tordon	Dig or repeated cutting	None
<i>Araujia sericifera</i>	bladderflower	Escort; Glyphosate	Dig, bag & burn	None
<i>Arctium lappa</i>	greater burdock	Glyphosate	Dig, bag & burn	None
<i>Arctium minus</i>	common burdock	Glyphosate	Dig, bag & burn	None
<i>Arctotheca calendula</i>	capeweed	Onduty	Repeated tillage	None
<i>Ardisia crennata</i>	coral ardisia	Glyphosate or Triclopyhr	Pull, bag & burn	None
<i>Arrhenatherum elatius</i>	tall oatgrass	Arsenal 50	Repeated tillage	<i>Minois dryas</i>
<i>Artemisia absinthium</i>	absinth wormwood	Dicamba; 2, 4-D; Picloram and Glyphosate	Tillage and repeated mowing	None
<i>Artemisia annua</i>	annual wormwood	Dicamba; 2, 4-D; Picloram and Glyphosate	Tillage and repeated mowing	None
<i>Arthraxon hispidus</i>	hairy jointgrass	Glyphosate	Tillage and repeated mowing	None
<i>Asphodelus fistulosus</i>	onionweed	-	-	-
<i>Atriplex semibaccata</i>	Australian saltbush	-	-	-
<i>Avena barbata</i>	slender oat	2, 4-D + Dicamba; Triatate	Repeated tillage	None
<i>Avena fatua</i>	wild oat	2, 4-D + Dicamba; Triatate	Repeated tillage	None
<i>Avena sterilis</i>	animated oat	2, 4-D + Dicamba; Triatate	Repeated tillage	None
<i>Barbarea vulgaris</i>	yellow rocket	-	-	-
<i>Bassia hyssopifolia</i>	smother weed	None	Pull, till or repeated mowing	<i>Lygus</i> sp.

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Bauhinia variegata</i>	orchid tree	-	-	-
<i>Begonia cucullata</i>	clubbed begonia	-	-	-
<i>Bellardia trixago</i>	bellardia	-	-	-
<i>Bellis perennis</i>	English daisy	-	-	-
<i>Berberis thunbergii</i>	Japanese barberry			
<i>Berberis vulgaris</i>	barberry			
<i>Berteroa incana</i>	common hoary alyssum			
<i>Brachypodium distachyon</i>	purple false brome			
<i>Brassica tournefortii</i>	wild turnip		Pull	
<i>Briza maxima</i>	quakegrass, rattlesnake grass	Glyphosate	Repeated mowing & burning	None
<i>Briza minor</i>	quakinggrass, little rattlesnake grass	Glyphosate	Repeated mowing & burning	None
<i>Bromus catharticus</i>	rescue grass	Glyphosate	Cutting & burn	None
<i>Bromus commutatus</i>	hairy chess	Glyphosate	Repeated mowing & burning	None
<i>Bromus diandrus</i>	ripgut brome	Glyphosate	Repeated mowing & burning	None
<i>Bromus inermis</i>	smooth brome	Glyphosate	Repeated mowing & burning	None
<i>Bromus japonica</i>	Japanese brome	Glyphosate	Repeated mowing & burning	None
<i>Bromus rubens</i>	red brome, foxtail brome	Glyphosate	Repeated mowing & burning	None
<i>Bromus secalinus</i>	cheat	Glyphosate	Repeated mowing & burning	None
<i>Bromus sterilis</i>	poverty brome, barren brome	Glyphosate	Repeated mowing & burning	None
<i>Bromus tectorum</i>	downy brome	Glyphosate	Repeated mowing & burning	None
<i>Broussonetia papyrifera</i>	paper mulberry			
<i>Bryonia alba</i>	white bryony			
<i>Bupleurum rotundifolium</i>	hound's ear			

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Calystegia pellita</i>	calystegia	-	-	-
<i>Campanula rapunculoides</i>	creeping bellflower	Gyphosphate; 2, 4-D	Dig	None
<i>Cardamine hirsuta</i>	hairy bittercress	Gyphosphate; Toryzalion	Pull, dig & bag	None
<i>Cardaria chalapensis</i>	lens podded hoary cress	2, 4-D + Glyphosphate	Pull, dig & bag	None
<i>Cardaria draba</i>	heart podded hoarycress	Glyphosate + 2, 4-D	Pull, bag & burn	<i>Brevicoryne brassicae</i> , <i>Myzodes persicae</i> , <i>Meligethes</i> sp.
<i>Cardaria pubescens</i>	hairy whitetop	Glyphosate + 2, 4-D	Pull, bag & burn	None
<i>Carduus acanthoides</i>	plumless thistle	Glyphosate + 2, 4-D	Tillage	<i>Urophora solstitialis</i>
<i>Carduus crispus</i>	welted thistle	Glyphosate + 2, 4-D	Tillage	<i>Rhinocyllus conicus</i>
<i>Carduus nutans</i>	musk thistle	2, 4-D; Dicamba	Tillage	<i>Rhinocyllus conicus</i>
<i>Carduus pycnocephalus</i>	Italian thistle	MCPA	Tillage	<i>Altesnaria</i> sp., <i>Puccinia</i> sp.
<i>Carduus tenuiflorus</i>	distaff thistle	MCPA	Tillage	<i>Alternaria</i> sp..
<i>Carex kobomugi</i>	Japanese sedge	Gyphosphate	Pull, dig	None
<i>Carpobrotus edulis</i>	Hottentot fig	Gyphosphate	Pull	None
<i>Carthamus lanatus</i>	wolly distaff thistle	Clopyralid; 2, 4-D; Dicamba or Glyphosate	Pull, dig	None
<i>Carthamus leucocaulos</i>	whitestem distaff thistle	Clopyralid; 2, 4-D; Dicamba or Glyphosate	Pull, dig	None
<i>Casuarina spp.</i>	Australian pine	Systemic Type	Bag & burn	None
<i>Cayratia japonica</i>	bushkiller	-	-	-
<i>Celastrus orbiculata</i>	oriental bittersweet	Glyphosate	Cut, pull & dig	None
<i>Centaurea biebersteinii</i>	spotted knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Urophora</i> sp., <i>Agapeta zoegana</i>
<i>Centaurea calcitrapa</i>	purple starthistle	Glyphopshate; 2, 4-D; Dicamba	Dig	<i>Bangasternus fausti</i>
<i>Centaurea cyanus</i>	garden cornflower	Glyphopshate; 2, 4-D; Dicamba	Dig	None
<i>Centaurea debeauxii</i>	meadow knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Agapeta zoegana</i>
<i>Centaurea diffusa</i>	diffuse knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Bangasternus fausti</i>

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Centaurea iberica</i>	Iberian starthistle	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Bangasternus fausti</i>
<i>Centaurea jacea</i>	Brown knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Urophora quadrifasciata</i>
<i>Centaurea macrocephala</i>	bighead knapweed	Glyphopshate; 2, 4-D; Dicamba	Repeated mowing & digging	None
<i>Centaurea melitensis</i>	Malta starthistle	Glyphopshate; 2, 4-D; Dicamba	Repeated mowing & digging	None
<i>Centaurea nigra</i>	black knapweed	Glyphopshate; 2, 4-D; Dicamba	Fire, tillage, mowing	None
<i>Centaurea nigrescens</i>	Tyrol knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	None
<i>Centaurea solstitialis</i>	yellow starthistle	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Bangasternus</i> sp.
<i>Centaurea sulphurea</i>	sulphur knapweed, Sicilian starthistle	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Bangasternus</i> sp.
<i>Centaurea trichocephala</i>	hairy head knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Bangasternus</i> sp.
<i>Centaurea triumphetti</i>	squarrose knapweed	Glyphopshate; 2, 4-D; Dicamba	Pull, bag & burn	<i>Bangasternus</i> sp.
<i>Ceratocephala testiculata</i>	bur buttercup			
<i>Ceratonia siliqua</i>	St. John's bread			
<i>Chenopodium ambrosioides</i>	Mexican tea			
<i>Chenopodium murale</i>	nettleleaf goosefoot			
<i>Chondrilla juncea</i>	rush skeletonweed	Transline picloram; 2, 4-D	None	<i>Cystiphora schmidtii</i> , <i>Aceria chondrillae</i>
<i>Chrysanthemum leucanthemum</i>	oxeye daisy	2, 4-D; Banvel	Dig	None
<i>Chrysopogon aciculatus</i>	small nedded goldbeard			
<i>Cichorium intybus</i>	chicory			
<i>Cinnamomum camphora</i>	camphor tree	Glyphosate	Repeated cutting	None
<i>Cirsium arvense</i>	Canadian thistle	Tordon; Roundup	Pull, bag & burn	<i>Trichosirocalus horridus</i>
<i>Cirsium vulgare</i>	bull thistle	Tordon; Roundup	Pull, bag & burn	<i>Rhinocyllus conicus</i>

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Clematis orientalis</i>	Chinese clematis	Versatil; Escort	Pull, dig or cut	None
<i>Clematis terniflora</i>	leatherleaf clematis	Versatil; Escort	Pull, dig or cut	None
<i>Clematis vitalba</i>	old man's beard	Versatil; Escort	Pull, dig or cut	None
<i>Cleome gynandra</i>	spiderflower			
<i>Clerodendrum bungei</i>	rose glorybower			
<i>Cnicus benedictus</i>	blessed thistle			
<i>Coccinia grandis</i>	ivy gourd			
<i>Coincya monensis</i>	star-mustard			
<i>Commelina benghalensis</i>	spiderwort			
<i>Conium maculatum</i>	poison hemlock	Escort; Tordon; Glyphosate	Pull, bag & burn	None
<i>Convallaria majalis</i>	lily-of-the-valley			
<i>Convolvulus wallichianus</i>	Wallich's bindweed	Glyphosate; Dicamba	None	<i>Aceria malherbe,</i> <i>Tyta luctuose</i>
<i>Conyza bonariensis</i>	hairy fleabane	Glyphosate		
<i>Coronilla varia</i>	crownvetch	Glyphosate	Repeated mowing & burning	None
<i>Cortaderia selloana</i>	pampasgrass	Glyphosate	Pull & dig	None
<i>Cosmos bipinnatus</i>	cosmos			
<i>Cosmos sulphureus</i>	cosmos			
<i>Crataegus monogyna</i>	singleseed hawthorn			
<i>Crepis capillaries</i>	smooth hawkweed			
<i>Crepis setosa</i>	bristly hawksbeard			
<i>Crepis tectorum</i>	narrow-leaved hawksweed			
<i>Crotalaria spectabilis</i>	showy rattlebox		Pull, dig	
<i>Crupina vulgaris</i>	common crupina			
<i>Cucumis melodudiam</i>	melon	Triclopyr	Tillage	None
<i>Cucumis myriocarpus</i>	paddy melon	Triclopyr	Tillage	None
<i>Cupaniopsis anacardioides</i>	carrotwood	Triclopyr	None	None

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Cynanchum louiseae</i>	black swallowwort, climbing milkweed			
<i>Cynanchum rossicum</i>	dog-strangling vine, European swallow-wort			
<i>Cynara cardunuculus</i>	artichoke thistle			
<i>Cynodon aethiopicus</i>	bermudagrass	Roundup; Rodeo	Dig & pull	None
<i>Cynodon dactylon</i>	bermudagrass	Roundup; Rodeo	Dig & pull	None
<i>Cynodon magennisii</i>	bermudagrass	Roundup; Rodeo	Dig & pull	None
<i>Cynodon nlemfuensis</i>	bermudagrass	Roundup; Rodeo	Dig & pull	None
<i>Cynodon plectostachyus</i>	bermudagrass	Roundup; Rodeo	Dig & pull	None
<i>Cynodon transvaalensis</i>	bermudagrass	Roundup; Rodeo	Dig & pull	None
<i>Cynoglossum officinale</i>	houndstongue	2, 4-D; Amine; Chlorsulfuron; Dicamba	Repeated mowing	<i>Mogulones cruciger</i> , <i>Longitarsus quadriguttatus</i>
<i>Cynosurus echinatus</i>	bristly dogtail grass			
<i>Cyperus rotundus</i>	purple nutsedge	Dual; magnum	Tillage	<i>Bactaca veturana</i> , <i>Puccinia canaliculata</i>
<i>Cytisus scoparius</i>	Scotch broom	Grazon; Tordon or Escort	Dig	None
<i>Cytisus striatus</i>	striated broom	Grazon; Tordon or Escort	Dig	None
<i>Dactylis glomerata</i>	orchardgrass			
<i>Datura quercifolia</i>	Chinese thornapple			
<i>Daucus carota</i>	wild carrot, Queen Anne's lace			
<i>Delairea odorata</i>	German ivy	Glyphosate	Pull, dig	None
<i>Dianthus armeria</i>	Deptford pink			
<i>Dioscorea alata</i>	white yam			
<i>Dioscorea bulbifera</i>	Chinese yam, air potato			
<i>Dipsacus fullonum</i>	common teasel			
<i>Dipsacus laciniatus</i>	cutleaf teasel			
<i>Dipsacus sativus</i>	indian teasel			
<i>Draba verna</i>	spring Whitlowgrass			

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Echinochloa crus-galli</i>	barnyardgrass			
<i>Echium vulgare</i>	blueweed			
<i>Ehrharta calycina</i>	veldtgrass	Glyphosate	Pull & dig	None
<i>Elaeagnus angustifolia</i>	Russian olive	2, 4-D; Glyphosate	Repeated cutting, pulling & digging	None
<i>Elaeagnus multiflora</i>	cherry silverberry	2, 4-D; Glyphosate	Repeated cutting, pulling & digging	None
<i>Elaeagnus pungens</i>	thorny olive	2, 4-D; Glyphosate	Repeated cutting, pulling & digging	None
<i>Elaeagnus umbellata</i>	autumn olive	2, 4-D; Glyphosate	Repeated cutting, pulling & digging	None
<i>Eleusine indica</i>	goosegrass, wiregrass			
<i>Elytrigia repens</i>	quackgrass	Atrazine; Roundup	Repeated tillage	None
<i>Emex australis</i>	southern dock			
<i>Emex spinosa</i>	spined dock			
<i>Epipactis helleborine</i>	helleborine orchid			
<i>Eragrostis cilianensis</i>	stinkgrass			
<i>Erechtites glomerata</i>	Australian fireweed			
<i>Erechtites minima</i>	Australian fireweed			
<i>Eriochloa villosa</i>	hairy cupgrass			
<i>Erodium cicutarium</i>	redstem filaree			
<i>Erodium moschatum</i>	musky stork's bill			
<i>Erysimum cheiranthoides</i>	wormseed mustard			
<i>Erysimum repandum</i>	spreading wallflower			
<i>Euonymus alata</i>	winged burning bush	Glyphosate	Repeated cutting or digging	None
<i>Euonymus fortunei</i>	winter creeper	Glyphosate	Repeated cutting or digging	None
<i>Euphorbia cyparissias</i>	cypress spurge	2, 4-D; Dicamba	Dig	<i>Hyles euphorbiae</i> , <i>Oberea erythrocephala</i> , <i>Aphthona</i> sp..
<i>Euphorbia esula</i>	leafy spurge	2, 4-D; Dicamba	Dig	None

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Euphorbia myrsinites</i>	myrtle spurge	2, 4-D; Dicamba	Dig	None
<i>Euphorbia oblongata</i>	oblong spurge, eggleaf spurge	2, 4-D; Dicamba	Dig, bag & burn	None
<i>Euphorbia serrata</i>	serrate spurge	2, 4-D; Dicamba	Dig, bag & burn	None
<i>Euphorbia terracina</i>	Geraldton carnation spurge	2, 4-D; Dicamba	Dig, bag & burn	None
<i>Fagopyrum tataricum</i>	tartary buckwheat			
<i>Fatoua villosa</i>	hairy crabweed			
<i>Festuca arundinaceum</i>	tall fescue	Glyphosate	Repeated mowing	None
<i>Festuca pratensis</i> <i>Festuca elatior</i>	meadow fescue	Glyphosate	Repeated mowing	None
<i>Ficus carica</i>	fig	Escort; Glyphosate	Dig, bag & burn	None
<i>Foeniculum vulgare</i>	sweet fennel	Glyphosate	Pulling or repeated tillage	None
<i>Frangula alnus</i>	glossy buckthorn			
<i>Galega officinalis</i>	goat's rue			
<i>Galeopsis bifida</i>	hempsnettle			
<i>Genista monspessulana</i>	frenchbroom	None	Pull	Goats
<i>Geranium dissectum</i>	cutleaf geranium	Deurinol; Treflan	Pull	<i>Acyrtosiphon malvae</i>
<i>Glaucium corniculatum</i>	red horn poppy			
<i>Glechoma hederacea</i>	creeping charlie			
<i>Halogeton glomeratus</i>	halogeton			
<i>Hedera helix</i>	English ivy	Tordon	Pull or dig	None
<i>Hemerocallis fulva</i>	orange daylily			
<i>Heracleum mantegazzianum</i>	giant hogweed	Glyphosate	Dig	Cattle & pigs
<i>Hesperis matronalis</i>	dame's rocket			
<i>Hibiscus syriacus</i>	rose of Sharon			
<i>Hibiscus trionum</i>	Venice mallow			
<i>Hieracium aurantiacum</i>	orange hawkweed	2, 4-D mixed w/Dicamba	Dig	None
<i>Hieracium caespitosum</i>	meadow hawkweed	2, 4-D mixed w/Dicamba	Dig	None

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Hieracium floribundum</i>	yellow-devil hawkweed	None	None	None
<i>Hieracium laevigatum</i>	smooth hawkweed			
<i>Hieracium pilosella</i>	mouse ear hawkweed			
<i>Hieracium piloselloides</i>	kingdevil hawkweed			
<i>Holcus lanatus</i>	velvetgrass			
<i>Hordeum murinum</i>	mouse barley			
<i>Hordeum vulgare</i>	barley			
<i>Humulus japonicus</i>	Japanese hop			
<i>Hyoscyamus niger</i>	black henbane	Glyphosate	Pull or dig	None
<i>Hypericum perforatum</i>	klamathweed, Common St. Johnswort	2, 4-D; Piclorem; Roundup	Tillage	<i>Chrysolina hyperici</i> , <i>C. quadragemina</i> , <i>Aphthona</i> sp..
<i>Hypochaeris radicata</i>	spotted cats ear	Glyphosate	Dig	None
<i>Ilex aquifolium</i>	English holly			
<i>Imperata brasiliensis</i>	Brazilian imperata	Glyphosate	Dig, pull or cut & burn	None
<i>Imperata cylindrica</i>	cylindrical imperata	Roundup	Dig, pull or burn	None
<i>Ipomoea cairica</i>	mile-a-minute weed	Roundup	Dig, pull or burn	None
<i>Ipomoea hederacea</i>	ivy leaf morningglory	Roundup	Dig, pull or burn	None
<i>Ipomoea purpurea</i>	tall morningglory	Roundup	Dig, pull or burn	None
<i>Iris pseudacorus</i>	pale yellow iris			
<i>Isatis tinctoria</i> L.	dyer's woad	2, 4-D; Escort	Pull & dig	None
<i>Ischaemum rugosum</i>	wrinkle duck beak			
<i>Kochia scoparia</i>	Mexican fireweed	2, 4-D; Banvel	Tillage	None
<i>Koelerutaria elegans</i>	golden rain tree			
<i>Lactuca serriola</i>	prickly lettuce			
<i>Lamium amplexicaule</i>	Henbit			
<i>Lamium purpureum</i>	hybrid nettle			
<i>Lantana camara</i>	lantana	Escort or Glyphosate	Repeated cutting	None

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<i>Lappula squarrosa</i>	european stickseed			
<i>Lapsana communis</i>	nipplewort			
<i>Leonorus cardiaca</i>	motherwort			
<i>Lepidium campestre</i>	field pepperweed	Glyphosate	Pull, bag & burn	None
<i>Lepidium latifolium L.</i>	perennial peppergrass	Glyphosate	Pull, bag & burn	None
<i>Lepidium perfoliatum</i>	clasping pepperweed	Glyphosate	Pull, bag & burn	None
<i>Lepyrodiclis holosteoides</i>	lepyrodiclis	None	Pull, bag & burn	None
<i>Lespedeza bicolor</i>	bicolor lespedeza	Glyphosate	Repeated mowing	None
<i>Lespedeza cuneata</i>	Chinese lespedeza	Triclopyr; Clopyralid; Glyphosphage	Repeated mowing	None
<i>Ligustrum lucidum</i>	glossy privet	Triclopyr; Clopyralid; Glyphosphage	Repeated mowing	None
<i>Ligustrum obtusifolium</i>	border privet	Accord; Roundup	Repeated mowing or cutting	None
<i>Ligustrum sinense</i>	Chinese privet	Accord; Roundup	Repeated mowing or cutting	None
<i>Ligustrum vulgare</i>	European privet	Accord; Roundup	Repeated mowing or cutting	None
<i>Linaria dalmatica</i>	Dalmatian toadflax	Picloram + 2, 4-D	Pull, bag & burn	<i>Brachypterolus pulicarius</i> , <i>Aphthona</i> sp., <i>Calophasia lunula</i>
<i>Linaria vulgaris</i>	yellow toadflax	Picloram + 2, 4-D	Pull, bag & burn	<i>Brachypterolus pulicarius</i> , <i>Aphthona</i> sp., <i>Calophasia lunula</i>
<i>Lolium perenne</i>	perennial ryegrass	Glyphosate	Repeated mowing	None
<i>Lolium temulentum</i>	darnel	Glyphosate	Repeated mowing	None
<i>Lonicera fragrantissima</i>	January jasmine	Escort; Accord; Roundup	Hand pulling or digging	None
<i>Lonicera japonica</i>	Japanese honeysuckle	Escort; Accord; Roundup	Hand pulling or digging	None
<i>Lonicera mackii</i>	amur honeysuckle	Escort; Accord; Roundup	Hand pulling or digging	None

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<i>Lonicera morrowii</i>	Morrow's honeysuckle	Glyphosate	Pull or dig out	None
<i>Lonicera standishii</i>	Standish's honeysuckle	Glyphosate	Pull or dig out	None
<i>Lonicera tatarica</i>	tatarian honeysuckle	Glyphosate	Hand pulling	<i>Hyadaphis tatariace</i>
<i>Lotus corniculatus</i>	birdfoot trefoil, birdfoot deervetch			
<i>Lycium barbarum</i>	matrimony vine			
<i>Lygodium japonicum</i>	Japanese climbing fern			
<i>Lygodium microphyllum</i>	small-leaved climbing fern			
<i>Lysimachia vulgaris</i>	garden loosestrife	Glyphosate; Triclopyr + 2, 4-D	Pull, bag & burn	<i>Galerucella californiensis</i> , <i>Gopusilla</i> , <i>Hylobius transversovittatus</i>
<i>Lythrum hyssopifolium</i>	hyssop loosestrife	Glyphosate; Triclopyr + 2, 4-D	Pull, bag & burn	<i>Galerucella californiensis</i> , <i>Gopusilla</i> , <i>Hylobius transversovittatus</i>
<i>Lythrum maritimum</i>	pukamole	Glyphosate; Triclopyr + 2, 4-D	Pull, bag & burn	<i>Galerucella californiensis</i> , <i>Gopusilla</i> , <i>Hylobius transversovittatus</i>
<i>Lythrum portula</i>	spatulaleaf loosestrife	Glyphosate; Triclopyr + 2, 4-D	Pull, bag & burn	<i>Galerucella californiensis</i> , <i>Gopusilla</i> , <i>Hylobius transversovittatus</i>
<i>Lythrum thymifolia</i>	thymeleaf loosestrife	Glyphosate; Triclopyr + 2, 4-D	Pull, bag & burn	<i>Galerucella californiensis</i> , <i>Gopusilla</i> , <i>Hylobius transversovittatus</i>
<i>Lythrum virgatum</i>	wandlike loosestrife	Glyphosate; Triclopyr + 2, 4-D	Pull, bag & burn	<i>Galerucella californiensis</i> , <i>Gopusilla</i> , <i>Hylobius transversovittatus</i>
<i>Macfadyena unguis-cati</i>	purple aster			
<i>Macleaya cordata</i>	tree celandine			
<i>Marrubium vulgare</i>	horehound			
<i>Medicago lupulina</i>	hop medic			

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<i>Medicago polymorpha</i>	burclover	Glyphosate	Pull , dig or cut	None
<i>Melaleuca quinquenervia</i>	paperbark tree	None	Pull, dig or cut	<i>Oxyops vitosa</i> , <i>Lophyrotoma zonalis</i>
<i>Melia azedarach</i>	Chinaberry tree	Garlon	Pull, dig or cut	None
<i>Melilotus officinalis</i>	yellow sweetclover	Glyphosate; 2, 4-D + Dicamba	Repeated burn & mowing	<i>Sitona cylindricollis</i>
<i>Melinis repens</i>	Natal grass			
<i>Mesembryanthemum crystallinum</i>	ice plant	Glyphosate	Pull & dig	None
<i>Microstegium vimineum</i>	Japanese stiltgrass	Glyphosate	Pull & dig	None
<i>Milium vernale</i>	spring millet grass			
<i>Mimosa diplotricha</i>	two-thrush mimosa			
<i>Mimosa pigra</i>	slow mimosa			
<i>Miscanthus floridulus</i>	Japanese silvergrass			
<i>Miscanthus sinensis</i>	zebra grass			
<i>Misopates orontium</i>	lesser snapdragon			
<i>Morus alba</i>	white mulberry			
<i>Mosla dianthera</i>	miniature beefsteak			
<i>Muscari botryoides</i>	grape hyacinth			
<i>Muscari comosum</i>	tassel hyacinth			
<i>Muscari neglectum</i>	common grape hyacinth			
<i>Nandina domestica</i>	heavenly bamboo			
<i>Nardus stricta</i>	moor matgrass			
<i>Nepeta cataria</i>	catnip			
<i>Nephrolepis cordifolia</i>	sword fern	Glyphosate	Dig	None
<i>Neyraudia reynaudiana</i>	Burma reed	Roundup	Cut & burn	None
<i>Onopordum acanthium</i>	Scotch thistle	Dicamba w/2, 4-D	Dig	Goats
<i>Onopordum illyricum</i>	Illyrian thistle	Dicamba; 2, 4-D	Repeated mowing	Goats
<i>Onopordum tauricum</i>	Scotch thistle	Dicamba; 2, 4-D	Repeated mowings	None

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<i>Ornithogalum umbellatum</i>	Star-of-Bethlehem			
<i>Oxalis pas-caprae</i>	Bermuda buttercup	Glyphosate	Pull & dig	None
<i>Paederia cruddasiana</i>	sewer-vine			
<i>Paederia foetida</i>	skunk-vine			
<i>Panicum antidotale</i>	blue panicgrass			
<i>Panicum miliaceum</i>	wild-proso millet			
<i>Papaver dubium</i>	poppy			
<i>Parthenium hysterophorus</i>	Santa Maria feverfew			
<i>Paspalum dilatatum</i>	dallis grass			
<i>Paspalum scrobiculatum</i>	kodo millet	Glyphosate	Repeated mowing	None
<i>Pastinaca sativa</i>	wild parsnip			
<i>Paulownia tomentosa</i>	princess tree			
<i>Peganum harmala</i>	harmel, African rue	Glyphosate	None	None
<i>Pennisetum ciliare</i>	buffelgrass	Glyphosate	Repeated mowing	Sheep & goats
<i>Pennisetum clandestinum</i>	Kikuyu grass	Glyphosate	Repeated mowing	Sheep & goats
<i>Pennisetum macrourum</i>	African feathergrass	Glyphosate	Repeated mowing	Sheep & goats
<i>Pennisetum pedicellatum</i>	kyasuma-grass	Glyphosate	Repeated mowing	Sheep & goats
<i>Pennisetum polystachyon</i>	mission grass	Glyphosate	Repeated mowing	Sheep & goats
<i>Pennisetum purpureum</i>	elephant grass	Glyphosate	Repeated mowing	Sheep & goats
<i>Pennisetum setaceum</i>	crimson fountaingrass	Dicamba; 2, 4-D	Pull, bag & burn	None
<i>Pennisetum villosum</i>	feathertop	Glyphosate	Repeated mowing	Sheep & goats
<i>Perilla frutescens</i>	beefsteak mint			
<i>Phalaris aquatica</i>	Hardinggrass			
<i>Phalaris canariensis</i>	reed canarygrass	Rodeo	Cutting & burning	None
<i>Phalaris minor</i>	littleseed canarygrass			
<i>Phellodendron amurense</i>	Amur corktree			
<i>Phleum pratense</i>	timothy			

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<i>Phyllanthus urinaria</i>	chamber bitter			
<i>Phyllostachys aurea</i>	golden bamboo	Amitrol; Glyphosate	Repeated cutting & burning	None
<i>Poa bulbosa</i>	boulbous bluegrass	Atrazine; Roundup	Cutting & burning	None
<i>Poa compressa</i>	Canada bluegrass	Atrazine; Roundup	Repeated burning	None
<i>Polygonum aviculare</i>	prostrate knotweed	Glyphosate	Digging & pulling	None
<i>Polygonum convolvulus</i>	wild buckwheat	Glyphosate	Digging & pulling	None
<i>Polygonum cuspidatum</i>	Japanese knotweed	Glyphosate	Digging & pulling	None
<i>Polygonum orientale</i>	Prince's feather	Glyphosate	Digging & pulling	None
<i>Polygonum perfoliatum</i>	mile-a-minute weed	Glyphosate	Digging & pulling	None
<i>Polygonum persicaria</i>	lady's-thumb	Glyphosate	Digging & pulling	None
<i>Polygonum sachalinense</i>	giant knotweed, sakhalin knotweed	Atrazine; Dicamba; 2, 4-D	Digging & pulling	None
<i>Populus alba</i>	white poplar			
<i>Potentilla recta</i>	sulfur cinquefoil	Tordor; 2, 4-D	Pull or dig	None
<i>Prosopis pallida</i>	cloaked prosopis	None	None	None
<i>Prosopis strombulifera</i>	spreading prosopis	None	None	None
<i>Pteris vittata</i>	Chinese brake			
<i>Pueraria montana</i>	kudzu	Glyphosate	Cut, bag & burn	None
<i>Ranunculus acris</i>	tall buttercup			
<i>Ranunculus arvensis</i>	corn buttercup			
<i>Ranunculus bulbosus</i>	bulbous buttercup			
<i>Ranunculus repens</i>	creeping buttercup			
<i>Ranunculus sardous</i>	hairy buttercup			
<i>Rapistrum rugosum</i>	common giant mustard			
<i>Rhamnus arguta</i>	buckthorn	Glyphosate	Repeated cutting & pulling	<i>Scotosia vetulata</i> , <i>Triphos dubiata</i>
<i>Rhamnus cathartica</i>	European buckthorn	Glyphosate	Repeated cutting & pulling	<i>Scotosia vetulata</i> , <i>Triphos dubiata</i>
<i>Rhamnus davurica</i>	Dahurian buckthorn	Glyphosate	Repeated cutting & pulling	<i>Scotosia vetulata</i> , <i>Triphos dubiata</i>

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Rhamnus utilius</i>	Chinese buckthorn	Glyphosate	Repeated cutting & pulling	<i>Scotosia vetulata</i> , <i>Triphos dubiata</i>
<i>Rhamus japonica</i>	Japanese buckthorn	Glyphosate	Repeated cutting & pulling	<i>Scotosia vetulata</i> , <i>Triphos dubiata</i>
<i>Rhodomyrtus tomentosa</i>	downy myrtle			
<i>Rhodotypos scandens</i>	jet bead			
<i>Ricinus communis</i>	castorbean			
<i>Rorippa austriaca</i>	Austrian fieldcress	2, 4-D; Glyphosate	Repeated tillage	None
<i>Rorippa sylvestris</i>	yellow fieldcress	2, 4-D; Glyphosate	Repeated tillage	None
<i>Rosa multiflora</i>	multiflora rose	Glyphosate	Repeated cutting or mowing	Not yet available
<i>Rubus discolor</i>	Himalayan blackberry			
<i>Rubus laciniatus</i>	cut-leaved blackberry			
<i>Rubus phoenicolasius</i>	wine raspberry			
<i>Ruellia brittoniana</i>	Mexican petunia			
<i>Rumex acetosella</i>	sorrel			
<i>Rumex crispus</i>	sour dock			<i>Gastrophysa viridula</i> , <i>Hypera rumicis</i> , <i>Uromyces rumicis</i>
<i>Rumex obtusifolius</i>	bitter dock			<i>Gastrophysa viridula</i> , <i>Hypera rumicis</i> , <i>Uromyces rumicis</i>
<i>Saccharum spontaneum</i>	wild sugarcane			
<i>Sagina procumbens</i>	birdseye pearlwort			
<i>Salsola collina</i>	slender Russian thistle			
<i>Salsola kali</i>	Russian thistle	2, 4-D + Glyphosate	Tillage	<i>Coleophora klimeschiella</i> + <i>C. parthenica</i>
<i>Salsola paulsenii</i>	barbwire Russian thistle	2, 4-D + Glyphosate	Tillage	<i>Coleophora klimeschiella</i> + <i>C. parthenica</i>
<i>Salsola tragus</i>	Common Russian thistle	2, 4-D + Glyphosate	Tillage	<i>Coleophora klimeschiella</i> + <i>C. parthenica</i>

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<i>Salsola vermiculata</i>	tumbleweed	2, 4-D + Glyphosate	Tillage	<i>Coleophora klimeschiella</i> + <i>C. parthenica</i>
<i>Salvia aethiopis</i>	Mediterranean sage	2, 4-D & Dicamba	Dig or till	<i>Phrydiuchus tau</i>
<i>Salvia pratensis</i>	salvia	2, 4-D & Dicamba	Dig or till	<i>Phrydiuchus tau</i>
<i>Salvia sclarea</i>	clary sage	Picloram; 2, 4-D; Dicamba	Dig or till	<i>Phrydiuchus tau</i>
<i>Salvia superba</i>	meadow sage	Picloram; 2, 4-D; Dicamba	Dig or till	<i>Phrydiuchus tau</i>
<i>Sapium sebiferum</i>	tallowtree	Garlon; Dow Elanco	None	<i>Eumeta</i> sp., <i>Meloidogyne javanica</i>
<i>Saponaria officinalis</i>	bouncingbet			
<i>Schinus molle</i>	pepper tree			
<i>Schinus terebinthif</i>	Brazilian pepper- tree			
<i>Schismus arabicus</i>	Mediterranean grass			
<i>Schismus barbatus</i>	Mediterranean grass			
<i>Scleranthus annuus</i>	German knotgrass			
<i>Sclerochloa dura</i>	hardgrass			
<i>Scolymus hispanicus</i>	golden thistle			
<i>Senecio jacobaea</i>	tansy ragwort	Tordon; 2, 4-D	Repeated tillage	<i>Longitarsus jacobaeae</i> , <i>Pegohylemyia seneciella</i>
<i>Senecio squalidus</i>	Oxford ragwort	Tordon; 2, 4-D	Repeated tillage	<i>Longitarsus jacobaeae</i> , <i>Pegohylemyia seneciella</i>
<i>Senecio vulgaris</i>	common groundsel	Tordon; 2, 4-D	Repeated tillage	<i>Longitarsus jacobaeae</i> , <i>Pegohylemyia seneciella</i>
<i>Senna occidentalis</i>	coffee senna			
<i>Sesbania punicea</i>	rattlebox			
<i>Setaria pumila</i>	kavatta grass			

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Setaria pumila</i> var. <i>pallide-fusca</i>	yellow bristlegrass			
<i>Setaria verticillata</i>	bristly foxtail	Primisulfuron + Atrazine	Repeated cultivation	None
<i>Setaria viridis</i>	green foxtail, green bristlegrass	Primisulfuron + Atrazine	Repeated cultivation	None
<i>Silene vulgaris</i>	bladder campion			
<i>Silybum marianum</i>	blessed milkthistle	Dicamba; 2, 4-D	Digging	<i>Rhinocyllus conicus</i>
<i>Sisymbrium altissimum</i>	tumble mustard			
<i>Sisymbrium irio</i>	London rocket			
<i>Sisymbrium loeselii</i>	tallhedge mustard			
<i>Sisymbrium officinale</i>	hedge mustard			
<i>Solanum cardiophyllum</i>	heartleaf horsenettle	2, 4-D + Banvel	Repeated mowing	None
<i>Solanum diphyllum</i>	twingleaf nightshade	2, 4-D + Banvel	Repeated mowing	None
<i>Solanum dulcamara</i>	bitter nightshade	2, 4-D + Banvel	Repeated mowing	None
<i>Solanum lanceolatum</i>	lanceleaf nightshade	2, 4-D + Banvel	Repeated mowing	None
<i>Solanum marginatum</i>	white-margined nightshade	2, 4-D + Banvel	Repeated mowing	None
<i>Solanum nigrum</i>	black nightshade	2, 4-D + Banvel	Repeated mowing	None
<i>Solanum viarum</i>	tropical soda apple	2, 4-D + Banvel	Repeated mowing	None
<i>Soliva sessilis</i>	lawn burweed	2, 4-D	Digging	None
<i>Sonchus asper</i>	perennial sowthistle	Dicamba; MCPA Amine;, 2, 4-D	Tillage	Sheep & cattle
<i>Sonchus oleraceus</i>	annual sowthistle	Dicamba; MCPA Amine;, 2, 4-D	Tillage	Sheep & cattle
<i>Sorghum alnum</i>	sorghum-almum	Glyphosate	Repeated tillage or mowing	None
<i>Sorghum bicolor</i>	shattercane	Glyphosate	Repeated tillage or mowing	None
<i>Sorghum halepense</i>	johnson grass	Roundup or Rodeo	Repeated tillage or mowing	None
<i>Spartina anglica</i>	cordgrass	Rodeo	Digging & pulling	<i>Claviceps purpurea</i> , <i>Prokelisia marginata</i>
<i>Spartina densiflora</i>	denseflower cordgrass	Rodeo	Digging & pulling	<i>Claviceps purpurea</i> , <i>Prokelisia marginata</i>

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Spartium junceum</i>	Spanish broom	2, 4-D & Picloran	Digging & pulling	Goats & chickens, <i>Aphis cytisoium</i> , <i>Eriophyes spartii</i>
<i>Spergula arvensis</i>	corn spurry			
<i>Sphaerophysa salsula</i>	Austrian peaweed, swainsonpea	Glyphosate	None	None
<i>Spiraea japonica</i>	Japanese spiraea			
<i>Stellaria graminea</i>	little starwort			
<i>Stellaria media</i>	common chickweed			
<i>Symphytum asperum</i>	rough comfrey	Glyphosate	Repeated mowing & tillage	None
<i>Tagetes minuta</i>	wild marigold	2, 4-D; MCPA; Glyphosate	Repeated tillage	None
<i>Tamarix africana</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix aphylla</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix aralensis</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix canariensis</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix chinensis</i>	Chinese tamarisk	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix gallica</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix parviflora</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix ramosissima</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tamarix tetragyna</i>	saltcedar	Rodeo, Arsenal	Pull, till, dig	<i>Trabutina mannipava</i> , <i>Diorhabda elongata</i>
<i>Tanacetum vulgare</i>	common tansy			
<i>Thlaspi arvense</i>	fanweed			
<i>Thymelaea passerina</i>	Mezereon Spurge flax	None	None	None
<i>Thymus praecox</i>	creeping thyme			

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Tradescantia fluminensis</i>	white-flowered wandering jew	Grazon	Pull	None
<i>Tradescantia spathacea</i>	oyster plant			
<i>Tragopogon dubius</i>	goat's beard			
<i>Triadica sebifera</i>	Chinese tallow tree			
<i>Tribulus cistoides</i>	puncture vine	Glyphosate	Pull, dig, repeated tillage	None
<i>Tribulus terrestris</i>	puncturevine			
<i>Tridax procumbens</i>	coat buttons			
<i>Trifolium arvense</i>	oldfield clover			
<i>Trifolium campestre</i>	field clover			
<i>Trifolium incarnatum</i>	crimson clover			
<i>Trifolium repens</i>	white clover, sweet clover			
<i>Triphasia trifolia</i>	lime berry			
<i>Tripleurospermum perforata</i>	scentless chamomile			
<i>Tussilago farfara</i>	coltsfoot			
<i>Ulex europaeus</i>	gorse	Glyphosate; Tordon	Burn	<i>Tetranychus lintearius</i> , goats, <i>Exapion ulicis</i>
<i>Ulmus parviflora</i>	Chinese elm			
<i>Ulmus pumila</i>	Siberian elm			
<i>Urochloa brizanth</i>	palisade signalgrass			
<i>Urochloa mutica</i>	para grass			
<i>Urochloa ramosa</i>	browntop millet			
<i>Valeriana officinalis</i>	garden heliotrope			
<i>Ventenata dubia</i>	North Africa grass			
<i>Verbascum blattaria</i>	moth mullein			
<i>Verbascum thapsus</i>	common mullein	Glyphosphate; Triclopyr	Pull, bag & burn	<i>Gymnaetron tetsan</i> , <i>Cucullia verbasci</i>
<i>Vernicia fordii</i>	tung oil tree			

Scientific Name	Common Name	Chemical	Mechanical	Biological
<i>Veronica arvensis</i>	corn speedwell			
<i>Veronica filiformis</i>	slender speedwell			
<i>Veronica persica</i>	winter speedwell			
<i>Viburnum lantana</i>	wayfaring tree			
<i>Vicia sativa</i>	garden vetch			
<i>Vicia tetrasperma</i>	sparrow vetch			
<i>Vicia villosa</i>	hairy vetch			
<i>Vinca major</i>	bigleaf periwinkle	Amitrol; Glyphosate	Dig or pull	None
<i>Vinca minor</i>	periwinkle	Amitrol; Glyphosate	Dig or pull	None
<i>Viola arvensis</i>	field violet			
<i>Vulpia myuros</i>	rat-tailed fescue			
<i>Wisteria floribunda</i>	Japanese wisteria			
<i>Wisteria sinensis</i>	Chinese wisteria	Tordon	Pull or dig	None
<i>Xanthium spinosum</i>	spiny cocklebur	Metribuzin; Dicamba	Pull, bag & burn	<i>Phaneta imbridana</i> , <i>Coleoptera</i> <i>cerambycidae</i>
<i>Zygophyllum fabago</i>	Syrian beancaper	None	Pull or dig	None

* **Note:** A blank within the control box indicates that no definitive control has been identified via scientific research or data not available.